An Amateur Radio publication for the Microwave enthusiast

MICROWAVE NEWSLETTER

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FROM THE EDITOR

2003 – FEBRUARY

As the Newsletter is going to press we seem to have a real shortage of UK activity news. In fact the news at the back end of this issue is almost all from North America! Maybe the UK stations are so busy with their winter construction programmes so we can expect a real explosion of activity this coming Spring!

Once again we thank all the contributors to this issue, especially the authors of the technical articles featured this month. Paul Wade's (W1GHZ) expertise in microwave antenna analysis is clearly shown in his article ... many thanks Paul. Thanks also to Julian, G3TFR, for his timely article on static discharge problems in the home and radio shack .... watch those HEMTs ! John, W3HMS sent in a fine collection of photos and a translated account from the intrepid F1PYR/P microwave group. Many UK 10GHz operators will have already worked Andre and his friends. Now you can see just how comfortable they are when out portable!

Page 2 details the Echolink and EQSO internet linking systems. Before you pour scorn on what you might describe as being "not amateur radio", just pause for while and try it for yourself. After pouring scorn myself I have now come around to seeing what it can offer microwavers!

Last, but certainly not least, take time to read and digest G3PFR's report on last November's Region 1 IARU conference. Its implications are far reaching. Don't be caught out by the frequency changes!

In this issue ...

News, views and articles for this newsletter are always welcome. Please send them to G3PHO (preferably by email) to the address shown below. The closing date is the Friday at the end of the first full week of the month if you want your material to be published in the next issue.

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SUBSCRIPTION ENQUIRIES SHOULD BE SENT TO RSGB HEADQUARTERS AT THE ADDRESS SHOWN AT THE TOP OF THIS PAGE AND NOT TO THE EDITOR ..

MAComm White Boxes

John Palfrey, who supplied UK amateurs with quite a few 10GHz "White Boxes" some years ago has 3 more at £100 pounds each. If any one is interested please ring me on 01454 778288 or E- mail so that I can pass the details on to him. The units are in North Somerset at the moment .

Roy Emery, G3FYX. Email to: royg3fyx@emery48.freeserve.co.uk

CHANGE OF EMAIL ADDRESS

I have changed my e-mail address as I have gone ADSL with Freeserve. The new address is **chris@chrisfdz.fsnet.co.uk** and is active now. The old AOL address (chrisfdz@aol.com) ceased on the 20th January 2003. Please update your address books accordingly.

73 .. Chris Whitmarsh G0FDZ

Wanted to Buy

One or two 3 port coaxial circulators suitable for 10.4 GHz.
Peter Blair,G3LTF
Telephone: 01264 738251, or 100633.1656@compuserve.com

Information Wanted ~ PIN switch

Does any Newsletter reader have any information on Microwave Associates PIN switches with built-in TTL drivers? I have acquired one, model ML17240-48A, which might be useful as a 1kHz modulator for my antenna testing kit project.

Barry Chambers, G8AGN [B.Chambers@sheffield.ac.uk]

ECHOLINK and EQSO …. Amateur Radio?

Some readers will already know what Echolink and EQSO are. For the uninitiated, they are two systems of linking amateur radio operators to each other, either with or without radio transmitting equipment, via the Internet. For some weeks now a number of UK microwavers have been using **Echolink** as a means of keeping in touch with each other when "normal" amateur radio links, such as 144MHz or even 80m, do not work.

Echolink involves downloading free software (2MB) from the Web (**www.synergenics.com**) and, after installing it on the computer, plugging in microphone and headphones (or speaker) into the sockets on the computer's soundcard. Once online, the Echolink software connects you up to hundreds and hundreds of fellow radio amateurs all over the world. You transmit voice modulation by simply pressing the spacebar on your computer and speaking into the microphone, just like "push to talk" on your transceiver. Pressing the spacebar again puts you on to receive. Thus contacts are only simplex.

If you wish, the link can involve "real" radio as you can access local "nodes" and repeaters via 2m or 70cm and get into the Echolink Internet-linked system that way. However, you would need a DTMF pad to do this whereas one is unnecessary if accessing via the computer. The computer screen shows a complete list of all stations currently online. It is a revelation to see how many are active each day and from which parts of the world they come!

The real value of **Echolink** for microwavers is that you can keep in touch with fellow enthusiasts across the globe, even if you do not have HF radio facilities. Imagine being able to talk to the Californian or Australian microwavers and to swap ideas and information or discuss your latest project. For EMEers iit is much more personal than an email after a moonbounce contact and much more immediate. It's also cheaper than an international phone call!

EQSO is the other system that does a similar thing. The software download is only a few hundred kilobytes (**www.esqo.net/**) but this neat little programme allows you to link your radio to a large number of repeaters and EQSO "gateways" around the world. Once again, each callsign appears on the computer screen. There are conversation "rooms" where folk tend to gather and where the various gateways can be accessed. "Room 101 English" is the most popular. The EQSO system looks a possibility for talkback during microwave activity days when the normal VHF link fails. Merely talk into your local 2m or 70cm gateway at both ends and the Internet will do the rest! A DTMF pad is not needed and in fact you can call CQ directly into an EQSO gateway! Using radio this way is really no different that using a normal repeater and one would assume this would be OK under the contest rules!

So far, the following UK microwavers have been heard on **Echolink**: G3GNR, G3JMY, G3PHO, G3LRP, G4ALY, G8ACE, G0FDZ and G4CCH. Access into the San Bernardino and San Jose (Silicon Valley) in the USA is easy and hopefully we are going to be able to contact microwavers out there soon. American readers please note and get on Echolink! For those of you without HF bands facilities here's your chance to talk to fellow microwavers all over the world. Try the system out and see what you think. It can't replace two way radio for this writer but it's a great alternative when band conditions on 20m or 80m are poor! Please send in your comments. **See you on Echolink one of these evenings!**

STATIC SENSITIVE DEVICES AND FINGERS

STATIC DISCHARGE EXPERIENCES

~ by Julian G3TFR

I am all too painfully aware of the effects of major static discharge, which can be encountered in some homes, or in office areas, even of electronics factories. One office carpet I knew would, on a dry day, raise a body to some tens of kV after only a few steps across it, resulting in a powerful jolt and involuntary, minor, muscle spasm, on touching the first filing cabinet or earthed metalwork. I tried a couple of measures to protect myself from this, carrying either a 10Mohm resistor to damp the oscillatory discharge, or a coin or key to spread it over a greater skin area to reduce the current density. A good 'crack' would then be obtained, with little finger-pain, though the arm muscles would still spasm. It intrigued me that some people appeared quite insensible to such discharges - I would notice from the corner of the eye that someone was approaching and about to lean against my filing cabinet, and while I was still trying to formulate a verbal warning, they would put out a hand to touch the cabinet, just as they began to speak: "I say, could you (KRRACK!!!) find me - er, what was that funny noise? - er, find me that purchase specification..." They literally hadn't felt a thing, just heard it, whereas I would have twitched and jumped, and would kick the filing cabinet for its audacity. So, I was more keenly aware than some, of the unstoppable discharge current of such a charge, and obviously no semiconductor device could survive such a discharge. The charge could easily be carried from the office to the bench. Merely pulling off an acrylic pullover while at the bench could prejudice everything in sight. Latterly, my procedure for protection from pullover-static is to touch, with the palms of the hands, a wall, preferably plastered brickwork, even if vinyl-emulsioned, which will safely discharge one in a second, without sensation.

PROBLEMS IN THE KITCHEN

'Laminate' wood-effect flooring also causes static charge accumulation, and a friend has frequent trouble from this in her kitchen. I noticed her FM radio on the worktop seemed to have become very insensitive, so I undertook to check the first RF transistor. I thought "if only they had bothered to isolate the device from the telescopic rod with a small-value series capacitor, or a small-value shunt RFC" and was then surprised to find both were fitted, but could not protect the bipolar device from the dreaded static.

ANTI-STATIC PRACTICE IN INDUSTRY

Most (all?) industrial electronics assembly facilities nowadays enforce strict static protection measures, including:

- anti-static clothing, tools, packaging, storage, stationery &c. &c.
- conductive flooring and conductive over-shoes, the flooring often consisting of a vinyl surface, but with flecks of black conductive elastomer connecting through to a conductive/resistive backing
- earth leads for personnel, connecting either to wrist straps or to studs on the conductive clothing which in turn have conductive elastic sleeves
- static-dissipative (capacitive) or conductive worktops, connected to ground

Note that all conductive paths such as ground straps, worktops and floors, are protected by high-value resistors or by highly resistive materials. A strict regime of tests and safety checks is employed and documented, including daily checks on all wrist straps. No operatives are allowed to work on the benches without these measures, and entry to some factory zones may be restricted.

MISATTRIBUTION

I am always contemptuous of attempts to make engineers wear wrist straps under all circumstances when working at the bench. They of all people should be aware of whether or not that is necessary, just as the competent driver should be aware whether or not it is always necessary to use the indicators. I would say that even rudimentary measures will eliminate the risk of static damage, and though I have often seen device failures at work which are attributed to 'static damage' I believe that such attributions are usually superstitious. Closer inspection will almost invariably reveal a 'true' cause. Microwave power FETs may destructively 'hoot' while being shimmed, sensitive Schottky diodes may be blown by induced earth-loop currents, internal bonds in MMICs may fail during soldering, or even spontaneously if manufacturing standards are poor.

A WARNING

I was recently asked to work on some microwave Doppler units (long-established microwavers will recall these

things with affection - see Peter's webpage article, "A History of 10GHz"). They consist principally of a bit of waveguide containing a Gunn diode which will always measure dead short on a DVM, but isn't, and one or two mixer diodes, which are seriously delicate, with reverse breakdown ratings around two to three volts - you can destroy them with the wrong DVM. I was seeing a large percentage of dead diodes, but found one good one and measured its sensitivity and ten minutes later, to my considerable chagrin, found it to be dead. I had even been using the blasted wrist strap, to please the client. Now, preparatory to starting this work, I had spent a day or more rebuilding the pair of fine old lab PSUs I intended to use, paying particular attention to replacing the mains leads, and observing 'best practice' by connecting the earth conductor using a crimp terminal, with star washer and lock-nut. They had MK plug-tops, which are the only ones which do not work loose their connections. Checking after the disaster, my DVM showed-up 100V AC between the two PSU outputs, though the static-sensitive fingers had not felt anything. This turned out to be due to slack screw terminals in the mains socket boards under the bench. Microwave constructors, go and ponder your own vulnerabilities!

MY RECOMMENDATIONS

1) Run a safety earth wire between every individual piece of equipment used on the relevant bench, connected to earth terminals where provided on the equipment, or to any convenient case screw.

2) When making periodic checks on earth connections, do not use a DVM as the response time is too slow to catch short intermittent breaks. Use a fast-responding buzzer, or a lamp-bulb and battery and waggle the cables.

3) Assume that the earth continuity of all mains sockets is suspect until checked and, once checked, assume it will fail sometime in the future.

4) Appreciate that copper wire will slowly deform under high pressure, which is why the cable connections on sockets, and non-MK plugs, nearly always loosen with time.

- Julian, G3TFR, Stockport

Analysis of the OK1DFC Septum Feed

Paul Wade, W1GHZ ©2003

The septum feed[1] was described by Zdenek, OK1DFC, at the 10th International EME Conference 2002 in Prague. On-the-air results were promising, but, like any new antenna, there were questions as to how well it really works. Computer simulations suggest that this feed should work well, and also suggest some variations to allow use over a range of dish ***f*/D**. The septum polarizer may also be used to generate circular polarization in other feedhorns.

Description

The septum feed as described by OK1DFC is an unflared square horn, or simply a square waveguide, with an internal stepped septum to generate circular polarization. Figure 1 is a cartoon of a septum feed with one wall cut away. The horn is excited by inputs on either side of the septum, with the two sides exciting opposite senses of circular polarization. For EME, this provides separate transmit and receive ports of opposite polarization. The excitation may come from two rectangular waveguides, each matching the dimensions of one-half of the square horn, or from a perpendicular probe on each side of the septum acting as an integral transition from coax to the waveguide. The two methods should provide identical results provided that the waveguide section before the septum is long enough to suppress any spurious modes.

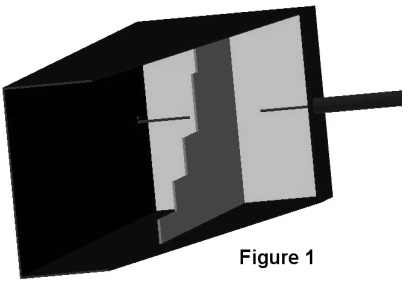


Figure 1

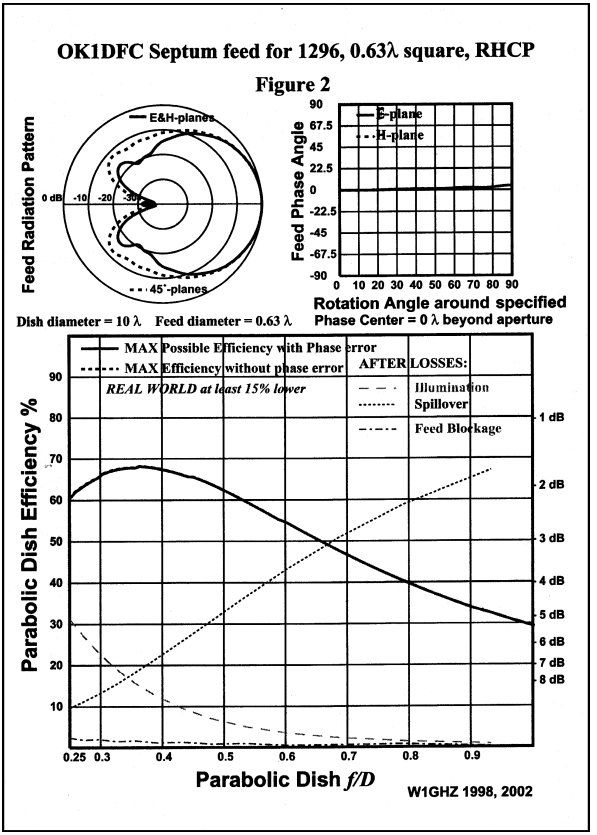
The radiating element, at the aperture, is simply a square horn. Rotated 45 degrees, it is identical to a diagonal horn[2]; if the diagonal horn is excited with circular polarization, then the radiated pattern should be identical. N7ART has shown[3] the diagonal horn to be a good feed, so we might expect the septum feed to be also. The version described by N7ART used phased crossed dipoles to generate circular polarization. The septum could be a better way to generate circular polarization.

The septum is a bit more complicated. A circularly polarized wave entering the aperture may be considered to have two polarization components with a 90º phase difference, one parallel to the septum and one perpendicular. The parallel component is divided equally by the septum and passes to the two rectangular input waveguides. The cutoff frequency for the perpendicular component is changed by the septum, so that the wavelength for the perpendicular component is shorter. Thus, the electrical length of the septum is longer for the perpendicular component than for the parallel component; if the difference in length is ¼ l, or 90°, then the horizontal and vertical components arrive in phase at the input. The components add together on one side and cancel on the other, depending on the sense of circular polarization, so that the two ports are isolated from each other. In order to achieve the difference in electrical lengths in a reasonable physical distance, the septum polarizer operates near the cutoff wavelength of the waveguides.

Simulations

A septum feed for 1296 MHz with dimensions specified by OK1DFC was simulated using Ansoft HFSS software[4]. The calculated radiation patterns in Figure 2 show the broad illumination expected of a small horn. Like other open waveguide feeds, the rear lobes are relatively large, only about 12 dB down, reducing the calculated efficiency to about 68% with best *f*/D around 0.35 to 0.4. Patterns for right and left hand circular polarization are pretty much identical. Patterns were calculated for both probe excitation and rectangular waveguide excitation; they were very similar, so the distance from the probe to the septum is adequate.

The circularly polarized pattern of the septum feed, shown in 3D in Figure 3, shows sidelobes on the four corners like the diagonal horn, generated as the polarization vector passes through horizontal and vertical polarization in the square horn. The sidelobes on the corners reduce the calculated efficiency by perhaps four percentage points compared to a calculation using only the traditional horizontal and vertical pattern cuts.



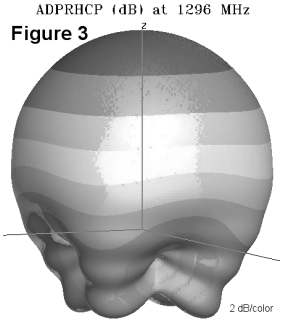


Figure 3

The circular polarization is quite good, with cross polarization about 21 dB down, and the pattern circularity is good. Isolation between the two ports is about 24 dB at 1296 MHz, with reasonable bandwidth, showing good isolation from at least 1.2 to 1.4 GHz. Note that reflection from the parabolic reflector reverses the circular polarization, so that the reflection coming back into the horn will reduce the isolation.

While the calculated efficiency of this feed is not as high as some, the better ones have a larger blockage shadow, so the septum feed may be the best performer on a small dish where circular polarization is required.

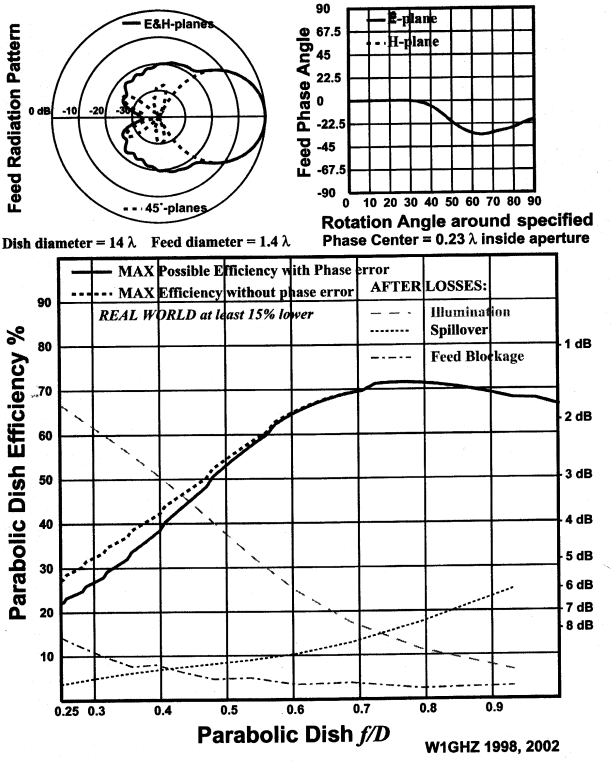
Other *f*/D dishes

The diagonal horn may be tailored to illuminate a various ***f*/D** by varying the dimensions of the diagonal section, or by adding a flared section for larger ***f*/D**. Since the operation of the septum in generating circular polarization depends on the guide dimensions being close to the cutoff wavelength, the square cross-section is fixed at 0.63l for a given operating frequency. However, a flare section may be added to increase the aperture size to optimize the horn for any larger ***f*/D**, so that the septum feed may be used for any dish with ***f*/D >** 0.3. The flare section is similar to a rectangular waveguide horn, except that it should maintain a square cross-section with a gentle taper to prevent excitation of unwanted modes.

I first tried a adding a flare section with an aperture 1.4l square and a flare angle of 30° (15° half angle on each side of the septum), since this size diagonal horn with linear polarization is a good feed for an offset dish with an equivalent ***f*/D** around 0.7. With the septum feed generating circular polarization, the calculated efficiency in Figure 4 is high with best ***f*/D** is around 0.7 to 0.85, suitable for many offset dishes.

OK1DFC Septum feed with flare to 1.4λ square at 1296, RHCP

Figure 4



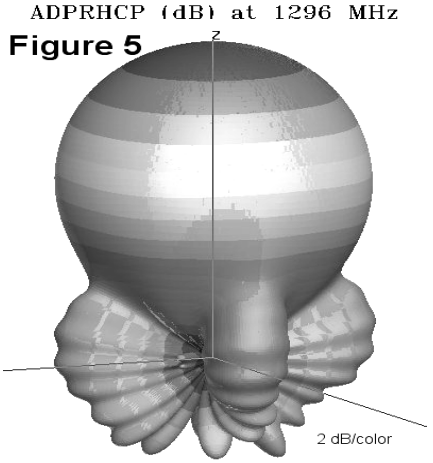


Figure 5

This horn also had high rear sidelobes on the corners, so that the 3D pattern in Figure 5 looks like a rocket with fins. An intermediate size flare, with an aperture 1.1l square, produces the radiation patterns with high calculated efficiency at intermediate ***f/D***, best around 0.5 to 0.6, and less pronounced corner lobes.

Both flared septum horns show good isolation and cross-polarization. Since horn beamwidth is inversely related to aperture size, we can choose an appropriate aperture for the flare for any ***f/D*** by interpolating between the results for the three sizes above, 0.63l square, 1.1l square, and 1.4l square. For smaller apertures, the flare angle should be small so that the flare length is reasonably long.

Summary

The septum feeds are impressive — a feedhorn with good circular polarization performance with no adjustments and no phasing losses. The simple square cross-section described by OK1DFC is ideal for low blockage on small deep dishes, while a choke may be added for better performance on larger dishes. A flare section to increase the aperture will better illuminate shallow and offset dishes. The septum polarizer can also be used in cylindrical horns like the VE4MA feed. More information is available on the OK1DFC (www.qsl.net/ok1dfc) and W1GHZ (www.w1ghz.org) web pages.

References

1. Zdenek Samek, OK1DFC, "Feed for Parabolic Dish with Circular Polarization," *10th International EME Conference 2002*, Prague, 2002. www.qsl.net/ok1dfc

2. A.W. Love, "The Diagonal Horn Antenna," *Microwave Journal*, March 1962, pp. 117-122. (reprinted in A.W. Love, *Electromagnetic Horn Antennas*, IEEE, 1976, pp. 189-194.)

3. R. Miller, N7ART, "A 23cm Diagonal Waveguide Feed," ***DUBUS***, 2/1997, pp. 5 14.

4. www.ansoft.com

Breaking the 3456 MHz North American DX record one km at a time ... UK ex-patriate does it by a cat's whisker!

On February 2, 2003 a high pressure area set up over the Gulf of Mexico. As a result, we had some spectacular tropo from Texas to Florida with conditions also being good to Alabama, Georgia and Tennessee. My best microwave DX in the morning was to W4ZRZ in EM63 in Alabama on 1296MHz. Later that evening, I decided to place a telephone call to Ron, WA8TTM/4 who resides in EL98DP. Ron had sent me numerous emails updating me on his 10 GHz efforts. At nearly midnite I get his voicemail which was probably better than getting one's wife at that hour. WA8TTM showed up on 2 meters some time later. **WW2R (a.k.a G4FRE)** and I proceeded to work Ron on 222, 432, 902, 1296, 2304 and even 3456MHz. The distance from EM13QC to EL98DP is 1508 km based on the 6 digit grid squares. So, when I worked WA8TTM on 3456 MHz, I broke my old 3456MHz record of 1507 km to KQ4PI. When **WW2R(in EM13QD) tail-ended me and worked WA8TTM, Dave broke my record by one km,** extending the North American 3456MHz record to 1509 km! A part of me said I just gave away my 3456MHz record! But oh well .... records are made to be broken. I have had my share. We had no success on 10GHz.

My equipment on 3456MHz is a 5 ft dish and 240 watts output. WW2R was running 5 watts output. I guess my 240 watts was warming up the atmosphere!

Best Regards, Al W5LUA (EM13QC) Allen, Texas

Portable microwaving … the French Way

From notes and photos by Jean-Pierre, F1DBE and a translation by John, W3HMS

Microwave Activity Day is enjoyed in the Eastern US, the UK and also in France. There are so many ways to do it and here is one from France. When Jean-Pierre, F1DBE, sent me some photos, I knew I had to ask for more along with text for translating as American and UK microwavers would surely like to see how it is done in another land. So he sent these photos and an OK for me to do the translation for the various Microwave magazines … John , W3HMS.

The setting up time for our portable station is about 45 minutes, by one person. The longest part is stabilizing and levelling the trailer. The mast is 7.6 metres tall with more than 2 metres in the support pipe. The antennas mount horizontally on the mast and can be made level and parallel one to the other. Everything is positioned properly with the aid of a hydraulic jack. The mast is raised with the aid of a 12VDC air compressor fed from a socket on the trailer via the car.

During 24 hour + contest activity, we use a rotator for turning the antennas . The rest of the time, they are turned by hand, this being more rapid but unpleasant in rain.

Here are some photos of the “Band of Four”, F1PYR, F1PHJ, F1FEM, and F1DBE at the time of the French National VHF Contest in March 2002 where the temperature was 2 degrees C (about 35 F) with rain and wind. Installing everything per the photos requires 3 hours for each expedition and the same amount of time for dismantling the equipment by 4 guys.

Happily the Chef was there for fixing some good hot dishes to eat! The callsign changes each year for the person who will do the cooking.
For a little (mouthwatering) history, the menu served at contest time was:

Saturday noon.... they call what follows "Auberge Espagnole", literally Spanish roadhouse which is to say that everyone arrives with his hands full of foodstuffs, kicks open the door and dumps his food items on the table. Everyone then serves themselves informally ....without forgetting that the erection of antennas, etc, is not finished, though the tent is in place.

Saturday evening .... I served my recipe very hot to warm the body. It was a beans and meat stew of my own creation with Toulouse sausage, slices of country lard, preserved duck accompanied with three kinds of vegetables, all topped with melted cheese and bread crumbs and a fine Bordeau wine aged in oaken barrels. (Note from W3HMS .... I translated this right before supper...UGH!)

Sunday noon ....some Tagliatelles , that is fresh pates with filet of salmon in a cream cheese sauce, fresh fruit soaked in dry white wine (we must drive home!) , without forgetting the cheeses, desserts, and real coffee ... and all of this worthy of a 4 star rating in the Michelin guide!

We do two contests as this group, the UHF in March and the IARU UHF in October.

We are usually active with :
144MHz / 100W / ANT 2 X 9 elem
432MHz / 100W / ANT 2 X 21 elem
23cm / 100W (or 10 W if close)
13cm / 10W

The 23 and 13cm use 1.42 metre dishes. The feed is a dual 23 / 13 type by OE1PMJ (Dubus n° 2 / 86)

5.7GHz/ 4W / offset antenna of 85cm used on 4 MSW bands
10GHz/ 8W
24GHz/ 500mW
47GHz/ a few mW

The tent has an area of 9 square meters.

73 from Jean-Pierre, F1DBE.

Translated by John Jaminet, W3HMS.

Ultra Wide Band ~ UWB

(or "When America sneezes, the UK catches a cold"!)

… a warning from Kent Britain, WA5VJB

Part I: What is it and what can it do?

If you have been flowing various electronics industry publications, you have heard the glowing promises of carrierless or UWB radio ... that their extremely short wideband pulses will not interfere with existing RF Radios.

My favourite example is saying that firing a 50 calibre gun in short bursts has the same average noise floor as a quiet library. It's those extremely intense bursts that cause the problems. Simple switcher circuits put 10 volt pulses into broad band (often fractal) antennas at 50 Ohms. This works out to about 2 watt pulses but even TTL Chips into "Non-Linear Transmission Lines" can create a Megawatt Pulse for 10 picoseconds.

So what happens when these strong short pulses hit a modern radio? First, we'll take a typical Cellular Phone Cell site. When the pulse hits the Antenna diplexer, it will ring the cavities. The Q of the cavity will stretch out the pulse. The pulse is still intense enough to saturate the first transistor in the receiver. This effect is very similar to a Nuclear weapon radiation pulse on semiconductors. The charge carriers in the transistor/FET have to reform but, more importantly, the Vcc and bias supplies have to charge back up. So the receiver isn't going to hear anything while the Vcc supply recovers.

Beyond this point, the pulse continues to lengthen in the tuned circuits of the mixer and IF stages. Possibly a new family of ultra fast Noise Blankers could be retrofitted to every communications radio in North America but IQ demodulator systems such as the CDMA cell sites with less dynamic range will see a dropout during these pulses.

UWB proponents keep preaching that their pulses are too short to bother other radios but that's just not so. Pulse Position Modulation is just like taking an old 1957 pickup truck with a unshielded ignition, and sending data by stomping CW on the gas pedal! It's dirty, it's noisy, and the proponents have gone to great lengths to avoid large scale field tests since taking out hundreds of TVs in Austin, Texas back in 1998.

Many two way services have purchased their frequencies. They do not take lightly that these UWB systems will be smearing broadband noise across their paid for frequencies.

What systems are most vulnerable to UWB? First is GPS, very weak signals and high gain amps. Next seems to be cell phone sites. So they can hear these new tiny phones, the front ends have got to a point where over half of the noise in the IF is the thermal radiation from dirt, and our own galaxy. UWB can take out the GPS reference that the CDMA cell phone sites use to sync, or just raise the noise floor and make your phone's battery run out faster getting over the noise.

I only know of one interference study done by someone who was not a proponent of UWB ... Our own FAA. Two UWB "Bluetooth" like links between laptops were flown during a test flight. The UWB links took out several flight critical cockpit systems!!

If you're in the two way industry, be afraid, be very afraid, of UWB!

Don't get me wrong, in our Irving lab we have 3 UWB Radars, UWB is an amazing technology with some very good uses. But putting a High Power UWB on a tall building and going into the broadcasting business is not one of them.

UWB Part II Filters and Un-Intentional Radiation

To help protect GPS and other services from UWB signals, they were restricted to 3.1-10.7 GHz.

3.1 GHz was kind of a funny number. Seems you are very restricted as to what kinds of filters you can send a UWB pulse though without completely destroying the waveform. One of these filters with max attenuation at GPS is basically a low Q 3.1 GHz HighPass Filter. Thus the 3.1 GHz lower limit. I don't know where the 10.7 GHz upper limit came from.

he Time-Domain UWB system put virtually all its UWB energy between 1.0 and 2.5 GHz. (After early tests they installed a 1 GHz HP filter, and the natural shape of the pulse has little energy above 2.5 GHz.)

Since their system really doesn't comply with the new FCC requirements, they now have a very interesting system architecture. There is a 3.1 GHz filter, and an antenna but there is a structure between the pulser and the filter designed to radiate. (Clandestine Antenna)

So it's just as noisy, eats up just as many systems but claiming the radiation before the filter falls under Part 15 non-Intentional limits. The FCC part 15 limits were based on the energy in a few carriers, not 1000MHz wide signals the same intensity as one CW carrier ... easily a thousand times more energy in the signals than the FCC or CE rules intended!

Editor's note: *Many thanks to Kent for this thought-provoking article. What with this and the idea of using the National (electricity) Grid for the Internet, it looks as if the next few years of Amateur Radio could be quite stressful, to say the least! Anyone for setting up a commune on Pitcairn Island?!*

RSGB Microwave Manager's Report on the IARU Region 1 Conference – San Marino

Several very significant changes to band usage in the microwave bands were debated and agreed in the Committee C5 (VHF, UHF and Microwave Committee). Some of these have already been outlined in the summary report published in the January 2003 issue of RadCom, under the heading "Band Plans". The purpose of this report is to expand on that summary report and give some more detailed background to the changes and how they will affect usage of the microwave bands in particular. A secondary aim is to provide background to the band plans that will appear in the 2003 RSGB Yearbook and on the Society's website.

New Narrowband Modes and Band Planning

The first significant change is the recognition and introduction of new modes, named Machine Generated Modulation (MGM). Although originally aimed primarily at HF, VHF and UHF usage where there is, at the moment, higher band occupancy than in the microwave bands, it was agreed that the basis of ***all*** future band planning will be by mode and bandwidth occupied by the signal. These new modes will be used for those amateur communication systems that use computer processing as an essential component of transmitting and receiving. Current examples of these are FSK441, JT44 and PSK31, primarily used for very narrowband, very weak signal enhancement making it possible in many instances to recover signals which are at, or below, the receiver system noise level. Such techniques are evolving rapidly and may be particularly useful in the microwave bands, as well as at the lower frequencies for which they were originally developed.

Since the bandwidth occupied by such modes is fully compatible with existing narrowband modes, such as CW, it was agreed that parts of the "CW only" or "CW exclusive" sub-bands would be used for MGM. This means that in future published band plans "CW" will be replaced by "CW/MGM".

In the **1.3 and 2.3GHz** band plans, therefore, the segments currently marked as "CW only" will be designated as "CW and MGM". That is 1,296.00 to 1296.150MHz in the "23cm" band, and 2320.00 to 2320.150MHz in the "13cm" band.

In the case of the **3.4GHz** ("9cm" band) things are slightly different since several Region 1 countries (but not the UK) have only a 2MHz-wide band, extending from 3,400 to 3,402MHz, all of

which is shown as Narrow Band CW/EME/SSB, with 3,400.100 MHz designated as the "centre of activity". MGM will, as already explained, co-exist comfortably with the existing usage band plan, needing only to have "MGM" added to the IARU column.

"Reframing" and the use of preferred Primary segments

Similar principles will be used in all the other, higher, microwave bands as the occupancy increases and needs arise. However, there are further complications and here we come to the second significant change that was debated and agreed at the conference.

At WRC 2000 there was considerable "re-farming" of the millimetre bands above 70GHz resulting in very significant band ***movements*** due to be implemented by all administrations by 2005. It is probable that these changes will now be implemented in the UK in the latter half of 2003 (possibly earlier) and have, indeed, already been implemented in some Region 1 countries, notably the Netherlands.

The Amateur/Amateur Satellite Primary (Exclusive) status given in WARC '97 has disappeared as a result of WRC 2000 and been replaced by Amateur/Amateur Satellite Primary (Shared). It has long been IARU policy to use the Amateur Primary segments in preference to Amateur Secondary segments, and it was agreed that in all bands where there is a Primary allocation, this must be used in preference to the Secondary allocation. The Amateur Services have Primary allocations in the 5.6 and 24GHz bands, and all the bands above 46GHz.

Dealing with the band ***movements above 71GHz*** first (but including the 24 and 47GHz bands for comparison), briefly these are as follows:

24GHz	No change, Primary 24,000 – 24,050MHz
47GHz	No change, Primary 47,000 – 47,200MHz

75.5 – 76.0GHz	Withdrawn
76GHz	Secondary 76,000 – 77,500MHz (new)
	Primary 77,500 - 78,000MHz (new)
	Secondary 78,000 – 81,000MHz (new)
122GHz	Secondary 22,259 – 123,000MHz (new)
134GHz	Primary 134,000 – 136,000MHz (new)
	Secondary 136,000 – 141,000MHz (new)
142 -144GHz	Withdrawn, replaced by 134GHz
241GHz	Secondary 241,000 – 248,000MHz (new)
248GHz	Primary 248,000 – 250,000MHz

Arising from these changes, it has been agreed that the first 10MHz segment of each of the bands shown above shall be reserved for ***all modes***, It was also agreed that both terrestrial and satellite narrowband activity including MGM, should be adjacent and located in the first 2 MHz of this 10MHz-wide segment.

In the case of the **5.6GHz** band, in accordance with the IARU policy, **it has been agreed that narrowband operation will take place in the segment 5,668 – 5,670MHz, rather than 5,760 – 5,762MHz**, with the same band planning principles applied here as in the other bands.

In the **24GHz band, the Primary segment 24,000 – 24,050MHz** is allocated to both the Amateur Services on an equal basis. Almost by default Amateur Satellite activity focuses on 24,048MHz in the Primary segment and certainly by default other (terrestrial) narrowband activity in Region 1 has been in the Secondary segment at 24,192MHz. There is a considerable technical argument for bringing together both satellite and terrestrial activity in one place, in the Primary segment of the band. There is no reason to suppose that terrestrial and satellite activities cannot co-exist in the 24,048 – 24,050MHz segment, although some hold the view otherwise! My personal recommendation would be to "suck it and see" and, ***only if necessary***, use the first MHz (24,048 – 24,049MHz) for satellite activity and the second MHz (24,049 – 24,050MHz) for terrestrial activ-

ity. In either event a 2MHz-wide segment is a manageable proposition – 50MHz isn't so easy!

Conclusions
So, there we have it! **The recommendation of IARU Region 1 Committee C5 is that these changes will come into full effect on 1 January 2004,** with the option of making the changes earlier where it is possible and desirable to do so. Designers and builders of amateur microwave equipment take note!

Mike Dixon, G3PFR, RSGB Microwave Manager.

Editor's comments: Since this report was received from Mike, I have also been sent a copy of the IARU Region 1 Newsletter t from Arie, PA0EZ. There isn't room to quote the whole report but here's an important part of Arie's newsletter.

- The third important change/addition to our bandplans concerns the bands above 24 GHz. The most important decision here is that in all those bands the segment where the amateur and the amateur satellite services have a primary status will be used initially. This implies that the current use by narrow-band activities of the 24192-24194 MHz segment must stop per 1-1-2004 and those activities shall move to the already recommended 24048-24050 segment.

Experience has shown that such a change will not be possible without the support of all microwavers. ***HERE AGAIN YOUR ACTIVE SUPPORT IS ESSENTIAL*** *by approaching those amateurs explaining the background. In the UK there are already problems in obtaining permission for unmanned operation in the 24192 MHz area. A good solution probably will be to not accept contest contacts in the "old" segment after 1-1-2004.*

So it is obvious that we in the UK are expected to move our 24GHz narrowband beacons and transverters to the 24048 to 24050 segment of the band **by the end if this year.** One assumes that the pattern will be the same as the lower bands in that .100 will be the so called calling frequency and that beacons will go into the first MHz from .800 to .999kHz. I suggest you make this a winter project, once the summer 2003 contests are over! There could be a "run" on crystals in Europe as a result of this move, so order yours now!

Unfortunately, Arie's and Mike's reports seem to differ when it comes to the **6cm band**. Whereas Mike clearly states that a move down to 5668-5670kHz is expected by the end of this year, Arie does not mention this and indeed has confirmed this in an email to your editor!

Anyone contemplating building beacons for these bands should be absolutely clear about which frequencies are to be used, before putting in their application forms. The Newsletter hopes to have more definitive information in the next issue.

Those of you building for 145GHz should now look at the new frequency allocations instead. Although, at the time of writing this issue, there has not been a Gazette notice to the effect, the frequencies have been available since the start of this year. You are not legally entitled to transmit on the new frequencies above 71GHz until the Amateur Licence has been suitably amended and gazetted. This could take several months yet. If you are desperate you should contact the RSGB Microwave Committee Chairman Julian Gannaway, c/o RSGB HQ at Potters Bar. He will advise you as to the best course of action.

GB3LES the Leicestershire 13cm beaconon 2320.955MHz is back on the air after some months being out of service. Reports please to the keeper...

Adam Moss. G0ORY <adamory@ntlworld.com

New World and North American 145GHz DX record

On 12 January, 2003, **W2SZ/4 worked WA1ZMS/4** with FSK-CW on 145GHz at a distance of **79.6km**.(The former record was 61.7km by W2SZ/4)
Date: Jan 12th, 2003. Time: 20:50z
W2SZ/4 in FM07fm (37-31-04N 79-30-40W)
WA1ZMS/4 in EM96wx (36-59-28N 80-07-17W)
WX at time of QSO on the EM96 end was **Temp:** -1.5C Dew Point: -18.3C Relative Humidity: 26% Calculated atmospheric loss: .193dB/Km

WA4RTS was the CW op at W2SZ/4 and was being helped at the time by W4WWQ and KA4YNO. WA1ZMS/4 was op of his own station and roving in EM96. Signal margin was about 2dB on the 'ZMS end and about 6dB on the W2SZ end. One station has a better RX mixer than the other.

This QSO is also the 5th grid needed for the ARRL VUCC award for the 145GHz band for W2SZ/4. This claim should be the very first VUCC for that band, and it took two years of hard work to make it happen.

More information with photos and an audio file is posted on **www.mgef.org**
73, Brian Justin, WA1ZMS

NORTH AMERICAN 47GHz ... some good DX by Will, W0EOM@aol.com

On Monday, Feb. 9 Bob, KF6KVG, and I made a contact on 47GHzz extending our previous best of 176km to 246km. Bob was east of Fresno, California, near Grants Grove (DM06MS) and I was east of San Jose on Mt. Hamilton (CM97EI).

We first acquired on 10GHz as an aid in pointing (my compass was not working). We then went to 47GHz and acquired in short order, about noon. Signals peaked at 20dB out of the noise with rapid fades up to 10 dB. Equipment was the same as last year except I added a one watt amp. It was really not needed for the contact but aided in acquiring. Information was exchanged by slow-speed cw.

Weather was great, about 60 degrees F, no wind, and low humidity. Monday was the last day of about a week of this weather. We had tried this path last summer without success.

We didn't try 76GHz as we had converted those rigs to 144GHz. Last Friday, Feb 7. ,we extended our range on that band to 25km .... likely our best but a long ways from what the East coast crew did.

Now to go after the world record!

ERRATA ... on Page 15 of last month's Newsletter we gave G4ALY's Locator Square as IO71VL. This should have read IO70VL ... our apologies Ralph!

ALL TIME SQUARES/DX LADDER

Entries ranked on squares. In cases of a tie the countries score determines the final order.
Entries must be from defined locations. An asterisk (*) denotes UK record.

BAND	CALL	LOC	SQ	COUNTRIES	DX	BAND	CALL	LOC	SQ	COUNTRIES	DX	BAND	CALL	LOC	SQ	COUNTRIES	DX
1.3GHz	G3XDY	JO02OB	123	23	1341	10GHz	G3WDG	IO92RG	55	16	1135	24GHz	G4DDK	JO02PA	7	3	268
	G4DDK	JO02PA	73	16	1005		G4KGC	IO92RG	52	15	1135		G3UYM/P	IO92CA	6	2	182
	G8VOI/P	IO90MX	66	18	1134		G4FCD	IO91KX	47	13	1062		G3WDG	IO92RG	5	2	*391
	G0RRJ	IO91FE	54	15	1174		G3XDY	JO02OB	42	12	1012		G3FYX/P	IO82JG	5	1	141
	G8VHI	?	39	?	1097		G4DDK	JO02PA	41	14	1005		F1GHB/P	IN88IN	4	2	158
	G8DKK	IO91VX	32	10	797		G4BRK	IO91DP	41	13	1115		G3PHO/P	IO93AD	4	2	128
	G6XDI	IO91SM	30	8	945		G3FYX/P	IO91GI	35	10	787		G4KNZ/P	JO02TD	3	2	173
	F1VBW	JN03SO	30	4	825		F1HDF/P	JN18GF	35	6	867		G4FCD	IO91KX	3	1	154
	G4LDR	IO91EC	22	6	593		G3GNR	IO70WT	34	11	*1275		G8VOI/P	IO90MX	3	1	88
	G0API	IO80XS	21	8	687		G8VOI/P	IO90MX	33	8	753		G3GNR/P	IO80AQ	2	2	154
	G3FYX	IO81RM	16	8	1165		G8APZ	JO01DO	30	10	1026		G8BKE/P(ii)	IO80WX	2	1	81
	GM4WLL/P	IO85NR	11	3	620		G4LDR	IO91EC	30	8	1118		G8BKE/P(I)	IO80RQ	1	1	100
	G0UPU	IO91AX	8	3	299		G3FYX	IO81RM	29	10	1138						
							G3JMY	IO81RM	28	8	1137						
2.3GHz	G3XDY	JO02OB	48	11	1179		G4BCH/P	IO90JO	25	7	1177						
	G4DDK	JO02PA	28	8	1005		G4EAT	JO01HR	24	8	721						
	G8VOI/P	IO90MX	18	6	770		G3PHO/P	IO93EH	23	8	586						
	F1VBW	JN03SO	18	1	825		G3UYM/P	IO92XA	22	6	522						
	G0RRJ	IO91FE	16	4	1174		G3JMB/P(I)	IO90TV	21	5	368						
	G4LDR	IO91EC	10	2	444		G8DKK	IO9VX	20	6	578						
	G3FYX	IO81RM	7	2	521		G8LSD/P(I)	IO90TV	20	5	384	47GHz	G3FYX/P	IO81XW	4	1	136
	G6XDI	IO91SM	6	1	183		G0API	IO80XS	19	5	489		G4KNZ/P	IO92CA	2	1	117
	G8DKK	IO91VX	6	1	174		F1GHB/P	IN88IN	19	3	431		G3UYM/P	IO92CA	2	1	65
	G0UPU	IO91AX	3	1	82		G8DKK	IO91VX	18	6	578		G8BKE/P	IO90MX	1	1	78
	G8BKE/P	IO80RQ	1	1	114		G4KNZ	IO91PJ	17	6	1052		G4DDK/P	JO????	1	1	39
							G0RRJ	IO91FE	17	5	442						
3.4GHz	G3XDY	JO02OB	15	3	506		G8LSD/P(ii)	IO80WP	16	4	385						
	G4DDK	JO02PA	9	5	754		G3JMB/P(ii)	JO01BB	16	3	368						
	G8VOI/P	IO90MX	8	1	214		G8LSD/P(iii)	JO01BB	16	3	368						
	G3FYX	IO81RM	4	3	487		G4MAP	IO82WJ	16		309						
	G3FYX/P	IO91GI	2	1	92		G3UKV	IO82RR	15	7	494						
	G8BKE/P	IO80RQ	1	1	114		G4JNT	IO90IV	14	4	339						
	G0UPU	IO91AX	1	1	19		G4RFR/P	IO80UU	14		414						
							G3ZME/P	IO82QL	13	4	357						
5.7GHz	G8VOI/P	IO90MX	17	5	730		F1VBW	JN03SO	13	1	665						
	G3XDY	JO02OB	14	5	415		GW4MAP/P	IO82JG	11		311						
	F1GHB/P	IN88IN	12	4	730		G0IVA/P	IO83XF	10	3	304						
	G4LDR	IO91EC	11	3	436		G0API/P	IO80UU	8	2	277						
	G3PHO/P	IO93AD	7	2	227		G0JDL	JO02UK	7	3	415						
	F1VBW	JN30SO	7	1	665		G8BKE/P(ii)	IO80XP	7	2	248						
	G3FYX/P	IO91GI	6	2	335		GM4JJJ	IO86GB	6	2	323						
	G3PHO/P	IO93EH	6	1	315		G0UPU	IO91AX	6	2	273						
	G3PHO/P	IO93FB	5	2	426		G3PHO	IO93GJ	5	3	748						
	G4DDK	JO02PA	3	3	233		G0WZV/P	JO??	5	3	279						
	G0UPU	IO91AX	3	1	124		G8BKE/P(i)	IO80RQ	4	2	242						
	G8BKE/P	IO80RQ	2	2	242		G3JMB	IO91WA	4	1	87						

UPDATED:12/02/03

Microwave League 2002
Final Scores

Callsign	1.3G Wkd	1.3G Dx	1.3G Score	2.3G Wkd	2.3G Dx	2.3G Score	3.4G Wkd	3.4G Dx	3.4G Score	5.7G Wkg	5.7G Dx	5.7G Wkd	10G Wkd	10G Dx	10G Score	24G Wkd	24G Dx	24G Score	47G Wkd	47G Dx	47G Score	76G Wkd	76G DX	76G Score	Grand Total
G3XDY	160	978	6286	57	923	10443	19	500	4871	18	415	1676	68	947	3680										26956
G4BRK	80	705	2265	20	601	2385	5	562	1441	5	298	334	54	576	1777	8.5	112	563							8765
HB9DRD	18	654	472							20	654	2936	62	654	2317										5725
G3PHO(/P)	31	366	455							10.5	515	1213	54.5	572	1781	11	139	905							4354
F1VBW	17	589	402	11	477	1041				19	546	2328	18	477	490										4261
G4LDR(/P)	16	411	264	9.5	229	431	5.5	225	634	14.5	422	1373	46	377	991	6	147	522							4215
G8BKE/P				1	78	15	2	198	203	2	198	88	23	298	391	6	139	493	2	79	1000	2	79	1000	3190
G8ACE/P																8	147	696	2	79	1000	2	79	1000	2696
OZ1FF													52	751	2231										2231
G0RRJ	86	213	735	9	213	380							35	428	856										1971
G8DKK	41	501	825	6	143	170							23	269	353										1348
G3JMY													34	427	829										829
G0UPU	12	299	144	4	82	65	1	19	9	1	124	27	10	273	156										401
G0GTZ/P													21	309	370										370
MOJTT/P													12	335	229										229
GM4WLL(/P)	6	620	149																						149
BAND																									
SCORING CALLSIGNS			10			8			5			8			14			4			2			2	
AVERAGE DX			533			343			300			396			478			171			79			79	
AVERAGE CALLS			46.7			14.7			6.5			11.3			36.6			9.9			2.0			2.0	
TOTAL SCORING CALLSIGNS			16																						

BAND SCORE CALCULATED = $\frac{\text{No. OF STATIONS WORKED}}{\text{AVERAGE No. OF STATIONS WORKED}}$ **X** $\frac{\text{MAX. PERSONAL DX WORKED}}{\text{AVERAGE DX FOR THE BAND}}$ **X** 1000

Compiled by G3PHO

See January 1999 Microwave Newsletter for Rules and www.qsl.net/g3pho